International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 09 Issue: 06 | Jun 2022 www.irjet.net p-ISSN: 2395-0072

SOLAR POWERED SUPERCHARGED IC ENGINE FOR MOTORCYCLES

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Abstract

The earth now relies heavily on renewable energy sources such as crude oil. These traditional energy sources have some limitations. Most importantly, there is a growing environmental concern about climate change caused by CO2 emissions from gasoline heating. Rising fuel prices make it necessary to improve the efficiency of the motorcycle; The efficiency of the motorcycle can be improved by reducing the fuel consumption of the engine. We can use solar energy to increase the efficiency of our vehicles. The compulsory induction system (supercharger and turbocharger) of automobiles helps to improve the efficiency of the internal combustion engines by pushing more air into the cylinder leading to proper fuel combustion and thus reducing exhaust emissions. The main objective of this project is to develop a powerful solar charger that will not consume additional engine power and thus increase engine efficiency and reduce CO2 emissions. Our proposed charger is powered by an electric charger and the charger is powered using a solar panel, thus the standard super charger is converted to a "solar powered super charger." After modeling, various tests are performed to monitor gas emissions and performance. of the engine.

1. INTRODUCTION

Nearly two billion internal combustion engines operate worldwide. The price of crude oil is constantly rising, which requires an effective solution to reduce fuel consumption in IC engines without disrupting engine performance. There are also a few environmental concerns related to the harmful effects of exhaust emissions from car engines. Researchers have made good progress in recent decades in increasing the efficiency of automotive engines and in controlling the pollution caused by fossil fuels. Compulsory import system, brings significant benefits to the overall efficiency of the car engine. A high quality supercharger or turbocharger can increase engine torque by 50% while also reducing CO2 emissions by 20%. Compulsory import system improves engine performance. Fuel and air are mixed in the right proportions due to the improved air flow, which leads to the proper combustion of the fuel and thus adds more energy to the piston, which in turn pushes harder to the crankshaft, providing more power. As a result, through the use of forced import in the system, additional power may be generated from the car engine. In addition, pollution from the engine can be reduced. A powerful solar supercharger can help build a fuel-efficient internal fuel-efficient and environmentally friendly engine. The purpose of this study was to develop a supercharger that uses solar energy instead of engine power, eliminating the need for engine power.

2. LITERATURE REVIEW

N.R.Karthik, B. Gautham: As a demand of new efficient and eco-friendly engines is incrementing new 2technologies are developing. This paper reviews on various applications of turbo charging and super charging technology is made. The behaviour of IC engine with application of turbo/super charger and need of turbo/super charger installations are studied.

Seungju Baek, Seungchul Woo, Youngkun Kim, Kihyung Lee using 1D simulation has proven that high power charging effectively improves temporary response and engine output. The electric supercharger has the advantages of reducing turbo lag and improving the torque of low-speed engine . The combination of electric supercharger and Miller Cycle in the fuel engine improves thermal efficiency without deterioration of performance.

Kamal kishore pathak In his study of superchargers he stated that the efficiency of a solar-powered supercharger is higher than that of a conventional charging system, that is, a power outage of an engine of the same capacity. As more air is pumped into the engine cylinder, complete combustion of the fuel may result in a reduction in emissions due to exhaust gases. The solar powered supercharger is producing charging pressure varies depending on load conditions.

3. METHODOLOGY

The operating principle of the solar powered supercharger is shown in Fig.1 In this system, the compressor (supercharger) receives power from the battery connected to the solar panel. The solar panel is a group of solar photovoltaic cells. Electricity can be generated from solar energy through the solar photovoltaic cells that operate on it.

Solar panel converts sunlight into direct current electricity. However, a single photovoltaic cell will not produce the desired amount of electricity. Therefore, most photovoltaic cells are arranged in a frame and connected to each other in a suitable electrical environment to form a photovoltaic module or solar panel. These solar panels can be installed on the back or front of the motorcycle and the battery should be connected to it to provide continuous power to the supercharger even when there is no sunlight..

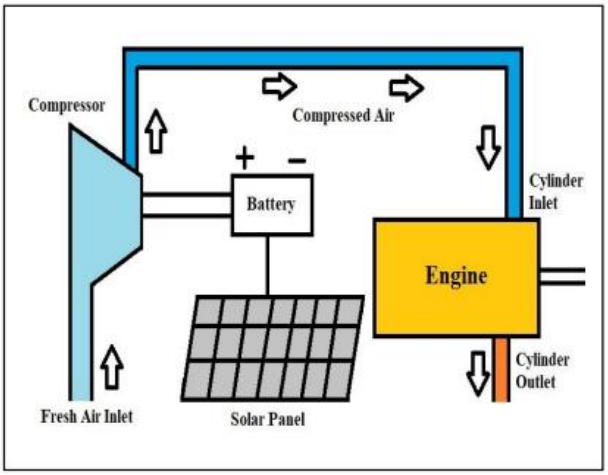

fig 1

4. CONSTRUCTION

Construction of this bike involves following components :

-A) Solar panel.

-B) Supercharging unit / Blower.

-C) Circuit for power storing.

A) Solar panel:

Solar panels use sunlight as a source of energy to generate direct current electricity. Polycrystalline solar panels are used for installation. This solar panel charges the on-board battery and can be easily mounted on the surface of motorcycle. The solar panel which is used to power the super charger can either be mounted on the wind shield of the vehicle or on the rear side of the vehicle so that the solar panel will not affect the aerodynamic performance of the vehicle. The fig.2 shows the installed solar panel.

Fig 2

B) Supercharging unit / Blower:

The figure below shows the supercharger. The device which is used here to supercharge the engine or the supercharger is a blower motor fan (12 V, 4.5 KW) which is used in automobile air conditioning units. The supercharger is associated with a regulator in order to regulate the speed of flow of air to the IC engine.

fig 3

C) Circuit for power storing:

The figure below shows the circuit diagram to establish the connection between solar panel and the battery to store the charge. A solar panel does not store electricity. It converts solar radiation energy into electric energy instantly. For energy storage, the solar panel is connected to a battery, typically with a charge controller in between to adapt the voltage of the solar panel to the battery system and optimize the charging process.

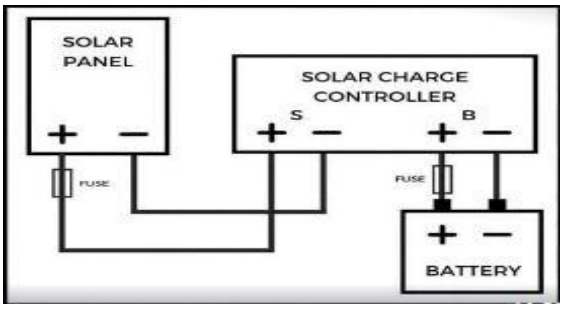

Fig 4

5. EXPERIMENTATION

A) Fuel consumption test:

The fuel consumption test was carried out on the motorcycle with and without supercharging and the following observations were made:

• It was found that 20 ml of fuel was used during the whole process in the non- supercharging state.

• It was observed that only 18 ml of fuel was consumed during the process in supercharged state.

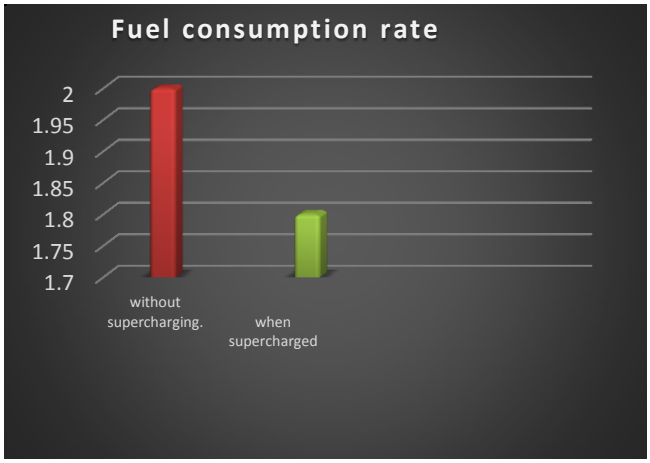

Fig 5

we can conclude from the fuel consumption test that the fuel consumption of the engine decreased when it was supercharged.

B) Emission Test:

Emission test was conducted on the vehicles exhaust pipe at two different rpms for both naturally aspirated and supercharged state and the readings of the pollution level was noted.

When compared to those of a naturally occurring state, the emission rates at the supercharged condition were lower. Fig.6 depicts the rate of carbon monoxide (CO) emission at two distinct states and RPMs. It should be emphasised that at higher RPMs, carbon monoxide emissions were negligible. In their supercharged condition, the rate of hydrocarbons and oxygen also decreased. Thus, we can conclude from the emission test that the emission made by the engine reduced considerably when supercharged.

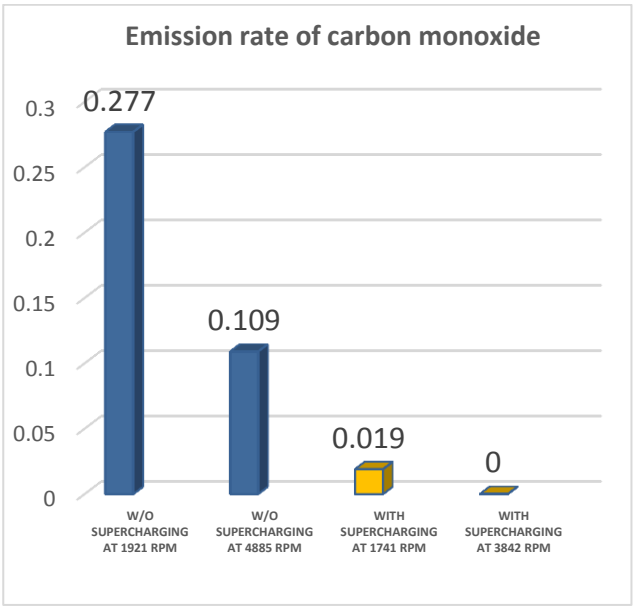

Fig 6

C) Load test:

The load test was conducted on the motorcycle with and without supercharging. The load test was conducted on naturally aspirant state, from the load test it was observed that the performance of the engine increased considerably when supercharged. The engine RPM increased by 250 RPM when supercharged without any additional fuel consumption. The fig.7 shows the line graph showing load test conditions before and after supercharging.

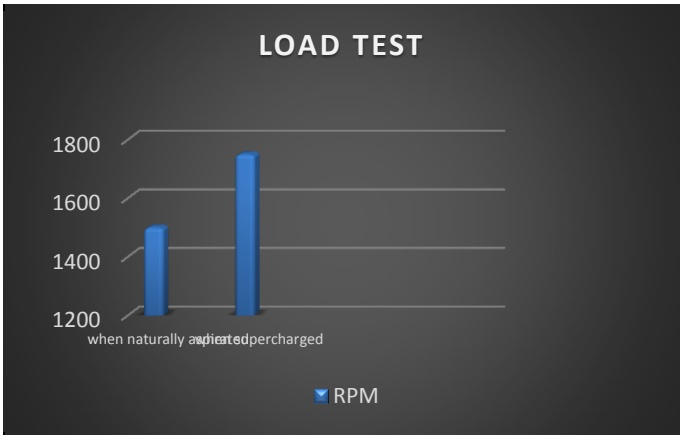

Fig 7

6. CONCLUSION

The following interpretations were made after experimentation:

• Following the fuel consumption test, we discovered that when the engine was supercharged, the engine's fuel consumption reduced.

• Emission rates in the supercharged condition were lower as compared to those in a normally occurring state. As a result of the emission test, we can deduce that when the engine is supercharged, the emissions produced by the engine are significantly decreased.

• Based on the load test, we can deduce that supercharging improved the engine's performance significantly. When the engine was supercharged, the RPM climbed by 250 RPM without any additional fuel usage. Therefore it can be concluded that it is possible to replace the conventional supercharger with a solar powered supercharger for a commercial motor cycle which can increase the engine performance considerably and can also reduce the carbon monoxide emission to a great extent.

7. REFERENCES

1) Xiaoxia Wei1, Jinfang Zhang "Research on renewable energy power generation complementarity and storage distribution model" 2017 IOP Conf. Ser.: Earth Environ. Sci. 52 012042.

2) Ashwani Kumar, Kapil Kumar, Naresh Kaushik "Renewable energy in India: Current status and future potentials" April 2010.

3) N.R Karthik, B. Gautam "A Review on turbocharger and supercharger" (September 2016)

4) Lee S. C., Lee K. H., Whang H.D., Choi S. W. and Cho H. M., 1996. "Supercharging performance of a gasoline engine with a supercharger", KSME Journal, 11(5):556-564.

5) Pakale P. N. and Patel S. U., 2015. "Performance analysis of IC engine using supercharger and turbocharger, IJRET: International Journal of Research in Engineering and Technology, 4.

6) Bae J. and Bae S. C., 2005. "A study on the engine downsizing using mechanical supercharger", Journal of Mechanical Science and Technology (KSME Int. J.), 19(12):2321-2329.

7) Owusu, Phebe Asantewaa, and Samuel Asumadu-Sarkodie. "A review of renewable energy sources, sustainability issues and climate change mitigation." Cogent Engineering 3, no. 1 (2016): 1167990.

8) Kondziella, Hendrik, and Thomas Bruckner. "Flexibility requirements of renewable energy based electricity systems–a review of research results and methodologies." Renewable and Sustainable Energy Reviews 53 (2016): 10-22.